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Water in the Environment/ Socio-Economic Development Discourse: Sustainability, Changing Management Paradigms and Policy Responses in a Global System

THE PURPOSE OF THIS STUDY IS TO PROVIDE A SUITE OF ANALYTICAL tools with which to address the problem of understanding and predicting water resource allocation and management and related policy-making processes. It will be shown that 'hydro-centricity' is not a safe starting point. Linking water resources to theories deriving from disciplines such as politics and international relations is also shown to be risky. The theoretical linkages must be much more comprehensive with culture, society and political economy being included as essential elements of a larger analytical framework.

Linking water and political and international relations analyses via environmental determinism has proved to be a fatally attractive intuitive explanation of how communities react to resource scarcity. Environmental determinism was totally discredited over six decades ago in the discipline of geography. But disciplines ranging from hydrology, politics, international relations to law have in the recent past been tempted by the beguiling simplicity of environmental determinism. The argument runs that if you run out of water you reach for a Kalashnikov or summon the air-strike. Communities in practice have choices and they can, and do, substitute for scarce economic factors. But it is a remarkable feature of the political and legal analysis of water relations that the preferred interpretation is that there is something of a straight-line trajectory, with shortage, anxiety, conflict and violence figuring sequentially in a linear mode.

This tendency to deduce violent outcomes is one of the dangers of hydro-centricity. When politics, international relations and legal analysts focus on water resources they are inadequately equipped to

address properly the water scarcity policy options. Their theorizing and observation tends to ignore processes operating in the political economy. This is a particularly dangerous approach in relation to water resources as there are economically invisible and politically silent processes that enable water-scarce economies to escape the challenges of their water deficits.

The most striking recent evidence of the temptation to devote misguided intellectual energy and misallocated funds to research inspired by environmental determinism was a project launched at the end of the Cold War. The four decades of Cold War confrontation had ended with an economic victory and not with a reckoning based directly on the enumeration of missiles. The security community, obsessed for 40 years by the precautionary posture of threatened mutual destruction, quickly recognized that national security had important economic, social and environmental dimensions beyond those of conventional military security. The reactive shift of focus on the parts of the security and the science communities was predictable. One project that attracted a strong coalition of funding trusts – MacArthur, Ford, Rockefeller – was a review of water resource security. The endeavour spanned the first half of the 1990s and sustained itself to the end of the decade. The intellectual basis of these studies was shallow environmental determinism. The outcome was a series of publications with titles exposing the banality of the assumptions driving the research such as ‘On the Threshold: Environmental Changes as Causes of Acute Conflict’, and ‘Environmental Scarcities and Violent Conflict: Evidence from Cases’.¹ Homer-Dixon even edited a publication entitled *Environmental Scarcity and Violent Conflict: Briefing Book*.² In the event, the cases did not fit the theory and Homer-Dixon had to conjure the concept of ‘ingenuity’ to explain why determinism did not work as explanation. The concept of the notion of ‘ingenuity’ had been identified in the 1920s and called ‘possibilism’. He then defaulted to making a virtue out of the

¹ Respectively, T. F. Homer-Dixon, ‘On the Threshold: Environmental Changes as Causes of Acute Conflict’, *International Security*, 16: 1 (1991), pp. 76–116; and T. F. Homer-Dixon, ‘Environmental Scarcities and Violent Conflict: Evidence from Cases’, *International Security*, 19: 2 (1994), pp. 5–40.

² T. F. Homer-Dixon and V. Percival, *Environmental Scarcity and Violent Conflict: Briefing Book*, Washington, DC, American Association for the Advancement of Science, 1996.

utility of introducing 'useful pessimism' in policy debates and de-emphasized the unsatisfactory intellectual outcome of the project.³

Other examples abound. Lowi had provided a very well-researched international relations interpretation of the hydro-politics of the Jordan Basin.⁴ She identified a relationship, which she captured in the term 'hegemonic cooperation'. This relationship reflected the coercive context in which the riparians contested the inadequate water resources of a river basin. The collective action outcome was predictably unfair but enduring. While useful, this analysis did not explain why the outcome endured despite the radical worsening of the resource circumstances. In a recent book, her mentor, John Waterbury, also a realist in inclination, provided a fine synthesis of the hydro-politics of international shared waters and of the Nile Basin in particular.⁵ Neither author satisfactorily explains why the unfair outcome has endured despite the dramatic worsening of the status of the shared water resources. Nor do they explain why the interesting but incomplete discourses that they have identified have been able to remain current and default to the same ideas despite the seriously worsening resource context.

The explanation of why hegemonic cooperation endures lies in the political economy. Much else is explained by processes operating in the political economy: for example, the simultaneous existence of contradictory discourses. Insiders contend that there is no water shortage; while outsiders insist there are serious shortages of fresh water and that these deficiencies are addressable.⁶ The economies in question, for Lowi in the Jordan Basin, have been able to access volumes of water equivalent to between 70 and 90 per cent of their

³ E. Hartmann, 'Strategic Scarcity: The Origins and Impact of Environmental Conflict Ideas', unpublished PhD thesis, University of London, LSE, 2003, at ehSS@hampshire.edu.

⁴ M. Lowi, *Water and Power: The Politics of a Scarce Resource in the Jordan River Basin*, Cambridge, Cambridge University Press, 1993.

⁵ J. Waterbury, *The Nile: National Determinants of Collective Action*, Newhaven, CT, Yale University Press, 2002.

⁶ J. A. Allan, 'Overall Perspectives on Countries and Regions', in P. Rogers and P. Lydon (eds), *Water in the Arab World: Perspectives and Prognoses*, Cambridge, MA, Harvard University Press, 1994, pp. 65–100; J. A. Allan, *The Middle East Water Question: Hydro-Politics and the Global Economy*, London, I. B. Tauris, 2001; J. A. Allan, 'Hydro-Peace in the Middle East: Why No Water Wars? A Case Study of the Jordan River Basin', *SAIS Journal*, 22: 2 (2002), pp. 255–72.

national needs via trade in food. Every tonne of grain imported allows the importing economy to avoid the costly environmental, economic and political stress of mobilizing 1,000 tonnes (cubic metres) of fresh water. The 1,000 tonnes of water associated with the production of each tonne of grain has been termed 'virtual water'.⁷ The importers also enjoy the advantage of cheaper commodities as the exporting economies – the USA and those in the EU – set prices as low as half the production cost of, for example, wheat, through subsidies. It is rather like an individual troubled by credit card debt in a Northern economy having access to long-term interest-free debt – with the added blessing of subsidized repayments. Such perverse economic solutions are nowhere gainsaid by governments that can avail themselves of the subsidies without making it public that they are doing so. Unrecognized, these invisible processes have spectacular impacts on the capacity of political scientists to identify reasons for the enduring and unfair water allocation at the same time as the non-conflictual collective action outcome.

International lawyers have also been tempted by the notion of environmental determinism. They conclude that international water law will be needed to address the problems of shared waters. Wouters, for example, has taken a pessimistic view of the water resource situation in the Middle East and concluded that operational international water law will be essential if conflictual relations are to be avoided.⁸ However, in the region where water lawyers are more numerous, in Colorado and other western US states, the very important idea has been coined that water resource problems can be solved in 'problemsheds' if they cannot be successfully addressed in the 'local watershed'. The notion

⁷ J. A. Allan, 'The Political Economy of Water [In The Jordan Basin]: Reasons for Optimism but Long Term Caution', in J. A. Allan, *Water, Peace and the Middle East: Negotiating Resources in the Jordan Basin*, London, Tauris Academic Studies, 1996, pp. 75–120; J. A. Allan, 'Virtual Water – Economically Invisible and Politically Silent: A Way to Solve Strategic Water Problems', *International Water and Irrigation Journal* (November 2001), pp. 4–11; Allan, 'Hydro-Peace in the Middle East'; A. Y. Hoekstra and P. Q. Hung, *Virtual Water Trade: A Quantification of Virtual Water Flows between Nations in Relation to International Crop Trade*, Value of Water Research Report Series 11, Delft, IHE Delft, 2002; A. Y. Hoekstra (ed.), *Virtual Water Trade: Proceedings of the International Expert Meeting on Virtual Water Trade*, IHE Delft, The Netherlands, 12–13 December 2002, Value of Water Research Report Series 12, Delft, IHE, Delft, 2003.

⁸ P. K. Wouters, 'International Water Law', unpublished doctoral thesis, Geneva, Graduate Institute of International Studies and University of Geneva, 1998.

of virtual water traded in water-intensive commodities is a fine example of the problem-solving capacity of a problemshd – in this case the global trading system – to address the problems of a local watershed with limited water resources.

The powerful insight of the problemshd forces us to shift the analysis from a hydro-centric focus to a comprehensive approach embracing the political economy and other relationships that are part of operational water allocation and use. The solution provided by the economically invisible and politically silent water, food and trade nexus solves the water-resource problem so spectacularly that the long-time players such as water policy makers – forgivably – and academic analysts – unforgivably – can pretend that familiar and reassuring discourses are still relevant.⁹ A very important example of the impact of the virtual water solution on political processes is found in the Middle East. Here discursive coalitions in individual economies can reinforce the politically acceptable ‘sanctioned discourse’ prevalent across the Middle East region, namely that ‘all we need is a little more water, then we shall manage it more carefully and everything will be all right’.¹⁰

The problemshd explanation, based on the movement of global virtual water to solve local watershed problems, is also consistent with the analytical approach of political ecology with its emphasis on how discursive coalitions determine environmental policy. Such coalitions can be well informed on underlying fundamentals, but even if well informed, they are also capable of constructing knowledge to address historically familiar rather than new and dangerously destabilizing risks.¹¹ The no-go area in such policy discourse is the topic of water and food insecurity. The global economy solves the problem but this is not an admissible truth in the Middle East region. It is politically feasible, on the other hand, to construct an acceptable argument that particular economies are secure, on the basis of the long-established

⁹ A. McCalla, ‘The Water, Food and Trade Nexus’, paper delivered at the MENA-MED Conference convened by the World Bank in Marrakesh, May 1997.

¹⁰ Allan, *The Middle East Water Question*.

¹¹ M. Hajer, *The Politics of Environmental Discourse: Ecological Modernization and the Policy Process*, Oxford, Clarendon Press, 1996; and J. A. Allan, ‘Contending Environmental Knowledge on Water in the Middle East: Global, Regional and National Contexts’, in P. A. Stott and S. Sullivan, *Political Ecology*, London, Edward Arnold, 2000, pp. 79–92.

sanctioned discourse, rather than on the basis of the security provided in the problemshd of global systems.¹² Backgrounding and foregrounding risk in this way is the natural language of politicians if not of environmental, social or political scientists.¹³ Goleman has provided the helpful notions that keep relationships in place. He suggests that enduring relationships require a mutual acceptance of 'simple truths' – 'all we need is a little more water'; and 'vital lies' – 'there is no water shortage'.¹⁴ Elsewhere, I have elaborated an exemplification for the Middle East, showing that water users and water policy makers are in denial in the Middle East and North Africa.¹⁵

There is one other category of commentators who have been consistently unhelpful in their contribution to the analysis of the role of water in international relations. The print and television media are addicted to reporting bad news and conflict. Those from the press corps who write about international water management always default to titles and copy about water wars.¹⁶ They weave conflicts from the 1960s into an analysis of the 1990s in the fashion of their profession. They ignore the actuality that there has been no recent armed conflict over water. They certainly do not emphasize that water shortage does not predict conflict in the most water-challenged area, the Middle East. The region's water resource status was immeasurably worse in the year 2000 than in 1965 but armed water conflict over water not been in evidence since the early 1960s.

DENIABLE UNDERLYING FUNDAMENTALS: TYPES OF WATER, TYPES OF ECONOMY

Any analysis of the water resources of a region facing water resource shortages could be based on awareness of environmental and economic fundamentals. In practice it is easy for those developing water policy to overwhelm the observed science of water scarcity with their own constructed knowledge. It has even been possible for resources

¹² Allan, 'Hydro-Peace in the Middle East'.

¹³ M. Douglas and A. Wildavsky, *Risk and Culture: An Essay on the Selection of Technical Environmental Dangers*, Berkeley, University of California Press, 1982.

¹⁴ D. Goleman, *Vital Lies, Simple Truths*, London, Bloomsbury, 1997.

¹⁵ Allan, *The Middle East Water Question*.

¹⁶ J. Bulloch and A. Darwish, *Water Wars*, London, Gollancz, 1993.

to take on the role of national fantasies.¹⁷ Fantasies are easier to accommodate than uncomfortable concepts and information that fails to gain a place in the policy-making discourse.

Even defining the analytical domain of water policy-making is politically subversive. Here are some important fundamental concepts that if kept out of the discourse make it easier to sustain familiar and comfortable, but blind, hydro-politics. There are two types of water – small water and big water. Small water is the water needed for drinking, domestic uses and the water needed by industry and services. The small water is about 10 per cent of the water needed by an individual as well as the 10 per cent of water needed for the security of an economy as a whole. This small water must come from freshwater sources – rivers, lakes, reservoirs and groundwater. Small water can command quite high prices and is commonly delivered for about US\$1 per cubic metre. The big water is the 90 per cent of water needed by an individual and economy to be self-sufficient in food. The water to raise food can come from freshwater sources in which case it competes with the provision of water for domestic and industrial livelihood uses as well as for the security of environmental services. The water to raise food can also come from the soil profile. Soil water, or effective rainfall, is the majority water in economies located in humid temperate and humid tropical regions. Semi-arid regions have to endure their very poor endowment in soil water. The huge volumes of big water are expected to be free if available in a soil profile. Much more worryingly, they are expected to be nearly free when delivered by a costly irrigation system from surface or groundwater sources.

The existence of soil water is denied by those who draw up the water budgets of national economies. Economists and engineers are also blind to its existence. Soil water accounts for at least 50 per cent of the water used to raise field crops worldwide. Soil water also accounts for most of the feed used to rear the world's livestock and almost all the timber and wood products that enter the world's economic systems. It is soil water in the temperate humid regions, which enjoy soil water surplus circumstances and can 'export' virtual water, that solves the water deficits of poorly endowed economies across the arid world. Hoekstra and Hung have estimated that 15 per cent of the water used to raise crops goes to raise commodities that enter

¹⁷ J. A. Allan, 'Natural Resources as National Fantasies', *Geoforum* (1983), pp. 243–7.

international trade.¹⁸ The number is much higher if the livestock trade is taken into account.¹⁹

The global phenomenon of about 1,600 cubic kilometres of water being marshalled annually in international trade to meet the needs of water deficit economies dwarfs the achievements of engineers to store and deliver water. More important it addresses something that the much less flexible engineering solutions cannot, namely the constantly variable demand for food across the global system. Trade is an ideal solution because of its flexibility as well as its extraordinary reach. Virtual water embedded in traded staple commodities can readily cope with the variable demands. It can also address the periodic emergencies brought about by drought and famine.

MODERNITY THEORY AND WATER ALLOCATION AND MANAGEMENT

Any analysis of water resource management at the global and the local levels is enhanced by an awareness of how water policy-making has been affected in the North by the ideas and technologies associated with modernity. An element of such analysis is also helpful in explaining why trajectories of investment and development have diverged between the North and the South with the onset of late modernity in the North since the late 1970s.²⁰

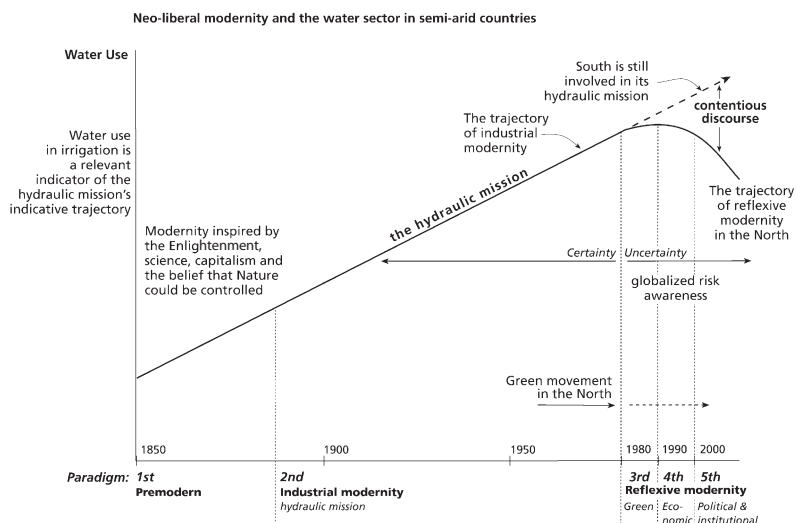
The engineering of water has figured in the histories of all civilizations and especially in the ancient civilizations, all located in arid and semi-arid regions. Water management has also absorbed the driving ideas and technologies associated with the modernity of the past two centuries. Engineers solve problems and engineers showed themselves to be very competent in solving water problems in early modernity. They came to be essential allies of the state in achieving economic goals such as food self-sufficiency. Politicians, engineers,

¹⁸ Hoekstra and Hung, *Virtual Water Trade*.

¹⁹ Hoekstra, *Virtual Water Trade*.

²⁰ J. Carter, *Keeping Faith: Memories of a President*, New York, Bantam Books, 1982; M. Reisner, *Cadillac Desert*, New York, Penguin Books, 1984; E. Swyngedouw, 'Modernity and Hybridity – The Production of Nature: Water and Modernisation in Spain', paper presented to the SOAS Water Issues Study Group, University of London, 25 January 1999; and Allan, *The Middle East Water Question*.

Figure 1
The Five Water Management Paradigms



farmers and food consumers were all certain that the progressively larger withdrawals of water, associated with what has come to be called the 'hydraulic mission' of 'industrial modernity' were good.²¹

Figure 1 shows the trajectories of freshwater use in the Northern and the Southern economies over the past two centuries. The constantly rising trajectory reflects the process of taking more and more water out of the environment to produce food in the agricultural sector. Before about 1980 'certainty' prevailed that capturing more water for food and fibre production was sound. The trenchant messages constructed by the green movement, especially in the western states of the United States, shifted the emphasis of the water discourse from 'certainty' to 'uncertainty'. By 1976, the US President Jimmy Carter wanted to raid the budget devoted to the building of more water diversion and storage structures to fund his ambitious social programme. In the event, the institutions that built the structures, the Corps of Engineers and the Bureau of Reclamation, in coalition with senators who had been waiting for years for their next dam, frustrated his intent. But his successor, Reagan, to the surprise

²¹ Swyngedouw, 'Modernity and Hybridity'.

of many, pushed through the Carter policies. The notion of uncertainty about the soundness of the hydraulic mission had gained such significance by the beginning of late modernity. Uncertainty became the dominant mindset underpinning water resource allocation in the North.

The neo-liberal North comprised only about 1 billion out of the 6.5 billion of the world's population at the turn of the millennium. The message of the uncertainty of late modernity accepted in the North proved to be rejectable in the economies of the South. It was especially rejectable in the major economies of China in East Asia and in those of South Asia. The three most populous economies in the Middle East – Egypt, Iran and Turkey – making up 75 per cent of the region's population, also rejected the idea that there should be an end to engineering interventions in their water environments.

Governments, engineering establishments and major water users in agriculture of over half of the world's population created almost unassailable coalitions against the arguments of the international green social movement and greened international agencies such as the World Bank. Many Northern bilateral donors, emulating the World Bank, also extended their green, and later their economic efficiency, principles to their aid policies. Figure 1 also illustrates the different trajectories of freshwater use in the arid and semi-arid North and the semi-arid South since 1980. In the neo-liberal North there was a shift towards putting water back into the environment. In the South, on the other hand, there remains a predictable commitment to taking more water out of the environment in order to further increase the output of food to meet rising food demands, to avoid dependence on imports, and to increase the wealth of the respective economies as a whole. It should be observed that these Southern economies also achieved spectacular increases in production, by four and five times in the major staple grains, between 1961 and the end of century. These increases resulted, first from increased freshwater use, secondly from the expansion of the rain-fed area of crop production, thirdly from increased efficiencies in the use of land and water and fourthly from the effective use of other inputs such as energy and fertilizers. Again a hydro-centric approach would lead to only a partial explanation of how these increases in crop production had been achieved.

The purpose of this amplification of the relationship between water resource use and the ideas in currency in the North and the

South is to emphasize both the changes in approach that can and have taken place through time and how these differ predictably between the North and the South. Any analysis of the allocative hydro-politics of a particular economy or region can only be understood in terms of the discursive politics of the region in question. In order to illustrate the nature of such discursive processes it is necessary to achieve some consensus on the meaning of sustainability.

WATER SECURITY: SUSTAINABILITY AS A USEFUL DISCURSIVE HYDRO-POLITICAL CONCEPT

The concept of sustainability is very relevant to any analysis of water policy. But it can lead to a very sterile analysis if its analytical scope is restricted to the water environment. An operational notion of sustainability is captured in the larger context of the sustainability of society, the economy as well as the maintenance of the environmental services provided by water in the environment. The concept of sustainability is very rich indeed if this threefold context is adopted. It is especially rich if discursive hydro-politics are seen to be integral to the achievement of an ever-changing definition of sustainability.

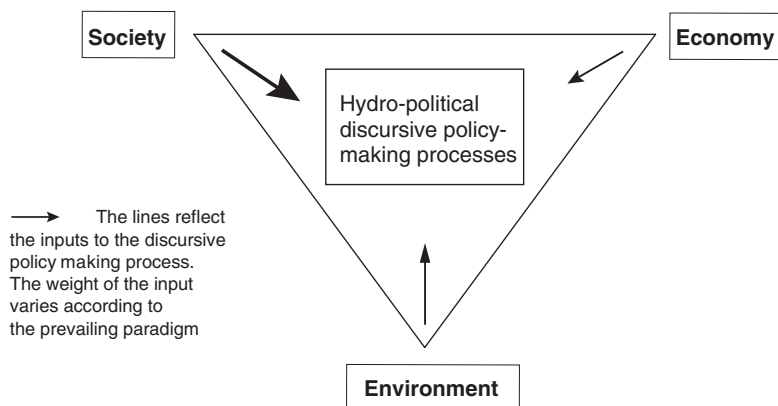
Figure 2 shows the three dimensions of water sustainability – social, economic and environmental – and the central mediating role of discursive hydro-politics. Sustainability is a discursive outcome of the contending articulated concerns of society, those involved in the economy and those anxious about the status of the environment. There is no market and no perfect regulatory system that brings about an optimum outcome. The outcome is second best in economic terms, less than satisfactory in social terms as well as inadequate in pleasing those who want to reconstruct pristine environments.

Political processes are also the only processes that can comprehensively, albeit imperfectly, respond to the driving forces of demography, technology and especially reflect the changing ideas in currency such as the innovations advocated by social movements. The diagram also shows how the level of emphasis given to social, economic and environmental principles in hydro-political processes changes through time. The diagram indicates how the emphasis in the water policy discourse is responsive to different actors – namely to the concerns of civil society, hierarchy (government), to civil

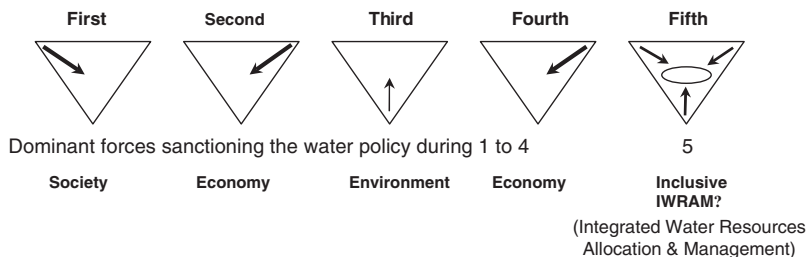
Figure 2

The Concept of Sustainability and the Water Sector; Water Management as a Political Process and Determining Perceptions of the Diverse Values of Water in the North. The third, fourth and fifth paradigms have only been very partially adopted in the South

Sustainability & discursive politics



Sustainability & water management paradigms in the North



movement (NGOs) and to entrepreneurs (the private sector). Identifying the actors involved in discursive hydro-politics is another useful service, which social scientists can contribute.

IDENTIFYING THE ACTORS: CULTURAL THEORY

The normal categorization used in identifying the relevant actors in allocating resources is the threefold division of civil society, govern-

ment and the private sector. In the area of water policy studies, cultural theory has been found to provide a very useful fourfold approach to categorizing the actors.

Figure 3 illustrates the four 'ways of life' identified by Douglas: civil society (fatalists), government (hierarchists), civil movements and NGOs (ethicists) and the private sector (entrepreneurs). Thompson used the approach to illuminate how the environment is managed and mismanaged.²² I have shown the framework to be particularly relevant to the water sector.²³ The space occupied by the four ways of life is defined by horizontal and vertical axes. The axis from left to right places the tendency to avoid control on the left and the tendency to want to impose control on the right. Most members of civil society and the private-sector players would like to be free of much of the control imposed by hierarchy. Those engaged in the government way of life and those who are driven by ethical principles are keen on control and regulation. They believe they know best.

The vertical axis is defined by a tendency to conformity at the top and a tendency to non-conformity at the bottom. The diagram also indicates the mechanisms that enable members of civil society to relate to hierarchy: employment, laws, taxes, conscription, honours, social services, pensions etc. – and the private sector – via employment, the purchase of goods and services, advertising, etc. In a neo-liberal polity the tendency is for about 45 per cent of the civil society to work for government and a similar proportion to work in the private sector. Employment is a very important feature of the processes by which the different ways of life interact. The diagram is also helpful in identifying the fundamental underlying tendency to encounter the 'private' of society – on the left of the diagram, and the 'public' – on the right. The nature of the public/private relationship differs from society to society. East Asian modes of the public/private, for example, are not captured by neo-liberal norms or regimes.

The diagram can be used in a dynamic analytical mode. And despite its neo-liberal inspiration and credentials, it can be used to

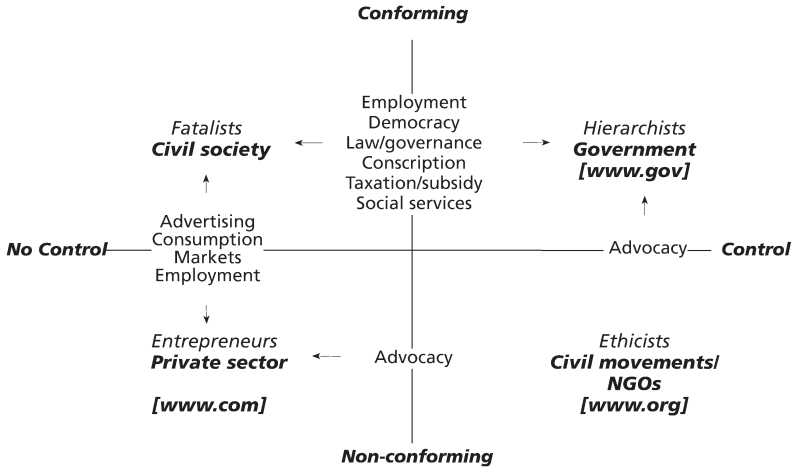
²² M. Thompson, 'Socially Viable Ideas of Nature: A Cultural Hypothesis', in E. Baark and U. Svedin (eds), *Man, Nature and Technology: Essays on the Role of Ideological Perceptions*, London, Macmillan Press, 1988, pp. 65–81; M. Thompson, R. Ellis and A. Widalvsky, *Cultural Theory*, Boulder, CO, Westview Press, 1990.

²³ Allan, *The Middle East Water Question*.

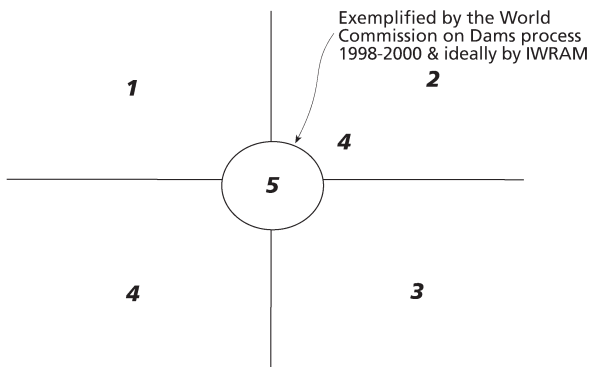
Figure 3

*The Four Ways Of Life Of The Mary Douglas Cultural Theory
Showing in the upper diagram (1) how some of the socio-economic processes through which the ways of life interact and (2) the uncanny prediction of the internet server structure; and in the lower diagram (3) how the sequence of water management paradigms can be mapped on to the ways of life categories*

The four ways of life



Mapping the water management paradigms on to the four ways of life



follow changes in political institutional relations in other parts of the world. The experience of China in the past century could be plotted as follows. By the middle of the twentieth century the simple notion of the public and the private – the left and the right on the diagram

– had been extended to include an incipient private sector. In addition the power of the civil movement, Communism, established itself and by the end of the 1940s took over power. As with any successful civil movement, with its tendencies to want to influence the controlling mechanisms of the state and society, the Chinese Communist Party decided that it did not need the private sector, nor did it need civil movements any more. China reverted in the late 1940s to a more normal Chinese version of the ‘public’ and the ‘private’ with its tendency towards deference to hierarchy. The reforms since the late 1970s have, however, begun to put back the private sector. And there is evidence of a growing participation of environmental civil movements in public discourse in China in the management of water.²⁴

It is easy to be sceptical that the simple ‘ways of life’ framework of Douglas, by way of some earlier thinking of Durkheim, could be of general utility. The diagram shows us that there is something fundamentally helpful in the approach. The ways of life idea was developed and published in the early 1980s, long before the internet servers of the world had been developed and networked. Interestingly the three ways of life that get society moving – the hierarchists, the ethicists of the social movements and the entrepreneurs of the private sector – have been categorized in their e-mail addresses as ‘.gov’ for hierarchists, NGOs as ‘.org’, and the private sector as ‘.com’.

It was shown above that it is possible to map the five paradigms elucidated via modernity theory on to the sustainability triangle and its social, economic, environmental and political dimensions. Figure 3 shows that it is also possible to map the five water management paradigms on to the four ways of life of cultural theory. The first paradigm is located in civil society, and the second, associated with industrial modernity, fits easily with the ways of hierarchy. High levels of public funding were devoted to the construction of major structures to store and redistribute water. This was true of the very different political traditions of the United States and the Soviet Union from the 1920s to the end of the 1970s. The onset of late modernity and the three paradigms of this era – the green paradigm, the

²⁴ S. Lee, *Development of the Civil Realm in Shanghai Water Services*, Occasional Paper 54, London, SOAS Water Research Group, 2003, at www2@soas.ac.uk/geography/waterissues/occasionalpapers/; S. Lee, *Expansion of the Private Sector in the Shanghai Water Sector*, Occasional Paper 53, London, SOAS Water Research Group, 2003, at www2@soas.ac.uk/geography/waterissues/occasionalpapers/.

economic paradigm and then the inclusive paradigm of water management – can be plotted on the ways of life diagram. The green inspiration is in the ethical sector. The economic paradigm, expressed in the message that water should be valued and even have a price and be distributed via water markets, is consistent with the alliance that often emerges between the state and the private sector. The water sector has its equivalent of the military–industrial alliance, especially at the international level. The fifth inclusive paradigm can be plotted in the middle of the diagram as it requires the participation of all ways of life – civil society, the public sector, the NGOs and the private sector.

The water sector has a recent very good example of how the fifth paradigm has inspired an activity of global and regional significance. The green civil movement generated a very contentious debate worldwide in the 1990s over dams as part of its environmental activism.²⁵ The response of an element of the global water policy community was to set up the World Commission on Dams (WCD) in 1998.²⁶ Twelve commissioners were selected and the minister of water of South Africa, Dr Kader Asmal, chaired the two-year consultation and research activity. The process was contentious; the outcome non-unanimous. But the process was of profound importance, not because it satisfied the participants and certainly not those watching the process closely from their entrenched positions. It was an example of a fifth paradigm discursive process in which contending positions were advocated, different insights articulated, some compromises made and many others were discovered not to be possible immediately. The post-WCD discursive hydro-politics have been just as interesting and just as important. Some water professionals have seen the WCD-published guidelines as a useful basis of ex-ante evaluation for future dam projects. Others have refused to recognize any virtue in the WCD approach. Nevertheless all sides have shifted positions. At worst defensive positions have become better informed about what is at stake. At best many ideas on sustainability, which were not on the agenda of dam evaluation, are now accepted and even commonplace. Engineers are well able to understand the inter-

²⁵ P. McCulley, *Silenced Rivers: The Ecology and Politics of Large Dams*, London, Zed Books, 1996; A. Roy, *The Cost of Living*, London, HarperCollins (Flamingo), 1999.

²⁶ World Commission on Dams, *Dams and Development*, London, WCD, 2001.

action of water bodies according to principles of hydraulics. Some have begun to see that contending approaches to knowledge are reflexive. The outcome of interacting ideas is reciprocal and rational in terms of politics and in the way the outcome reflects the evolution of contending interests.²⁷

CONCLUSIONS: GLOBAL PROBLEMSHEDS AMELIORATE THE DEFICITS OF WATERSHEDS AND NATIONS

Political analysis is not useful in explaining why water scarce regions can be economically secure or the extent of their involvement in water related conflicts. Politics is useful in the water sector in its capacity to explain what 'simple truths' and 'vital lies' are in currency in particular water policy discourses.²⁸

The relations over scarce water resources are likely to be highly politicized. The purpose of this paper has been to show that it is dangerous to predict hydro-political outcomes on the basis of a defined area and its environmental endowment – on for example, a river basin or a nation, or on the assumption that the amelioration of water scarcity depends on capturing new water resources. Social science and legal theory can be deployed to address such relationships but such hydro-centric theorizing will always come up with the wrong answer.

Political economies combine – to a greater or lesser extent according to their adaptive capacity – their five capitals of land (water), human capital, social capital, manufactured capital and financial capital. In relation to these five capitals, it is the social adaptive capacity deployed via political processes that achieves, or not, outcomes that address water scarcity.²⁹ Focusing on water is a misleading theoretical point of departure, which leads to incomplete and even banal

²⁷ J. Briscoe, 'Return to Resources for the World Bank', *Water21* (June 2003), pp. 13–15.

²⁸ Goleman, *Vital Lies*.

²⁹ Leif Ohlsson, 'Environment, Scarcity, and Conflict – A Study of Malthusian Concerns', unpublished PhD dissertation, Department of Peace and Development Research, University of Gothenburg, 1999; L. Ohlsson and A. R. Turton, *The Turning of a Screw: Social Resource Scarcity as a Bottle-Neck in Adaptation To Water Scarcity*, Occasional Paper 19, London, SOAS Water Issues Group, 1999, at www.soas.ac.uk/geography/waterissues/occasionalpapers.

explanation. Economies have been successfully substituting factors in which they are rich for those in which they are poor for millennia. The water-short have demonstrated that it is possible to cope with serious water scarcity by diversifying and strengthening their economies.

The central role of hydro-politics is also shown diagrammatically in Figure 2 which emphasizes the three-dimensional nature of security and sustainability. Local and national hydro-political discourse in particular polities mediates the nature of sustainable outcomes. Such discourse enables the voices of society, of the economy and of the water environment to interact and develop a broadly based discursive power with determining influence, rather than a narrowly based hydro-centric position without impact.

This paper has drawn on the idea of modernity to situate shifts in approach by those managing the political economies of the North and the South over the past two centuries and especially during the past 50 years. New ideas on the value of the environmental resources, such as water and their role in securing the environmental services of water, eventually overwhelmed a century or more of technological and economic certainty. Such certainties were reflected in the progressive mobilization of water resources to address immediate economic and social goals for the century and a half before the end of the 1970s. Five water management paradigms have been identified for the water-scarce economies of the semi-arid industrialized North. The reflexive water-using trajectory of late modernity (Figure 1) of these Northern political economies has not been implemented in the economies located in the semi-arid and less industrialized South. The notion of discursive hydro-politics is a recurring explanation in this paper. The explanatory power of discursive hydro-politics lies in its ability to capture first, the nature of responses of the water sector to the new ideas introduced by the green social movement and then by the epistemic water resource management community who saw water as an economic resource. The second contribution of discursive hydro-political purposes is in providing a narrative which highlights and demonstrates the divergence in the trajectories of water use in the North and the South.

Finally, the analysis shows that no single discipline has a suitable set of analytical tools to address the nexus of water resource security, water resource sustainability and the consequences of encountering water resource scarcity. The underlying observed science on first, the

hydrology and secondly, the economics of the balance between water availability and water demand of a river basin or nation, are inadequate foundations on which to analyse or predict water policy. It is much safer to use concepts combining politics and ecology – political ecology, and politics and economics – political economy. Political ecology helps identify the discursive coalitions that influence policy outcomes. Political economy encourages the analyst to look beyond the narrow regional focus of the river basin or the national boundary. Political economy provides the framework that frees us from the hydro-centric watershed. Such theory allows us to identify the economically invisible and politically silent virtual water that brings a version of water security and the possibility of local sustainable water-management regimes. Political analysis alone is not useful in explaining why water-scarce regions can be economically secure or the extent of their involvement in water related conflicts. Politics is useful in the water sector in its capacity to explain what ‘simple truths’ and ‘vital lies’ are in currency in particular constructed water policy discourses. Politics is a necessary but not a sufficient framework for the analysis of water resources and the security of those who encounter water scarcity.

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